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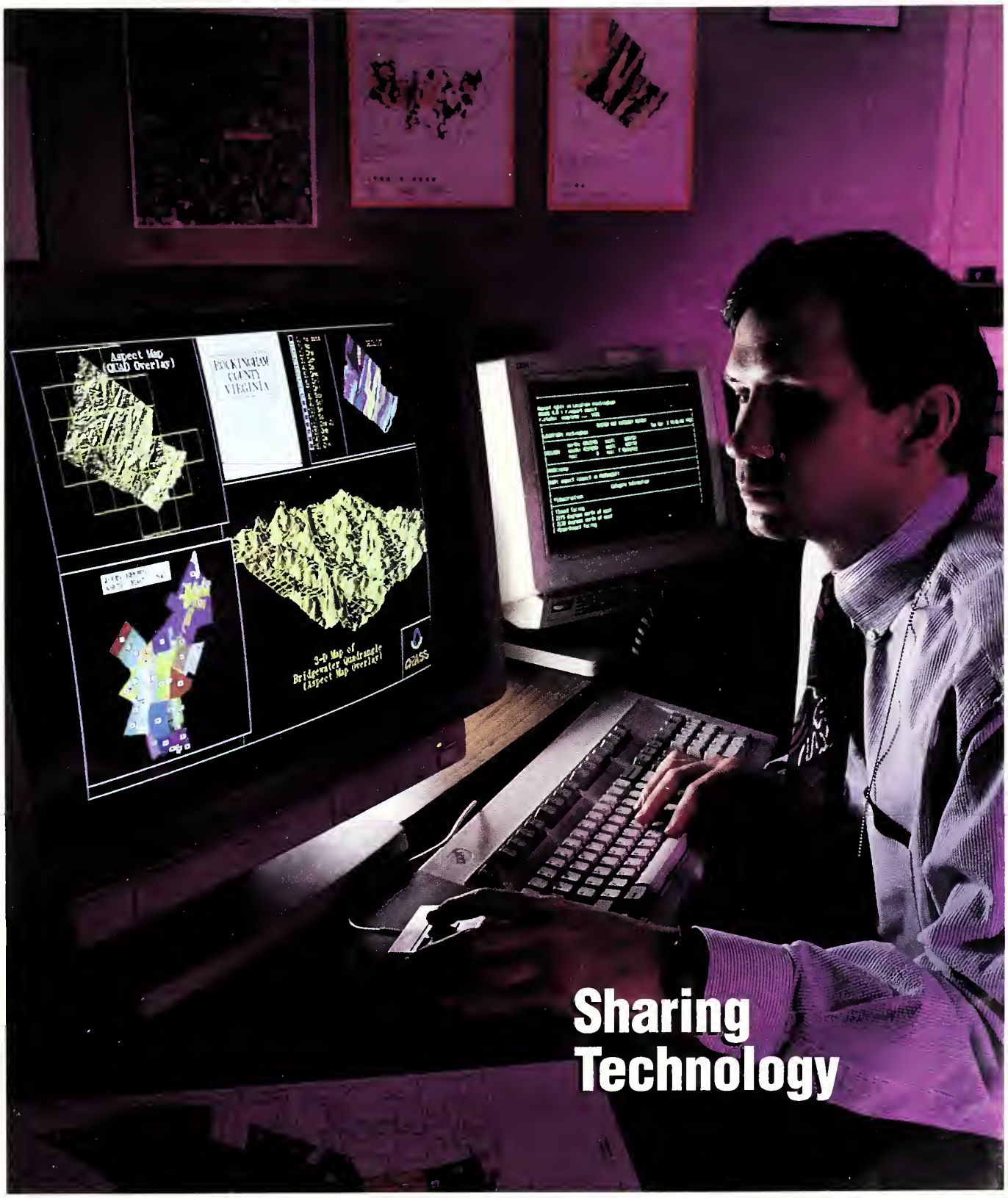

Sharing Technology

Cover: Lane Price, SCS Geographic Information System national applications leader, uses new GRASS GIS technology to test conservation planning scenarios for Rockingham County, Va. (Tim McCabe photo; 0792-01)

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Comments from the SCS Chief:

Technology: New Vision, Lasting Rewards

"To continually try to improve something that's already good is the joy of a creative mind."

I don't know who wrote that, but it's been on the wall back home for most of the 35 years I was farming. It's been a personal reminder to keep striving, to be creative and innovative. It's also been a reminder to leave the world at least a little bit better than I found it, and to have fun in the process.

Helping me and my neighbors to be innovative were the Soil Conservation Service and the whole U.S. Department of Agriculture/land-grant university system. As a part of that system now, I'm excited by the new technology that's transforming not only the lives of our customers but our technology delivery system as well.

At hand and on the drawing board are computer programs, field implements, and chemicals that help us target our energies and management, whether we're talking about crop residue management, grazing land management, water management, urban land management, or management of our conservation district field offices. Computers and geographic information systems are helping us see how the pieces of the environmental and economic "puzzle" fit together. They're giving us a much clearer vision as to how we can live productively and in harmony with a quality environment.

This issue of *Soil & Water Conservation News* takes you "behind the scenes" in SCS technology development and delivery. We want to share the excitement—and, yes, the fun—as the quality and accessibility of our services continually improve.

William Richards

Chief

Contents

Desktop Technology

Computers To Be Core of Conservation Assistance

Bill Patterson, SCS district conservationist, right, and Steve Leslie, SCS soil conservationist, use digital orthophotography and GIS software, GRASS, to test how conservation practices will improve a cooperator's farm in Rockingham County, Va. (Tim McCabe photo; 0792-02)

LOOKING TOWARD the year 2000, conservationists in the Soil Conservation Service's field offices will have a highly automated field operation. The heart of it will be computer-driven technology to link clients, other technical experts, and data bases.

Field offices will concentrate on resource systems and their interactions—a move away from treating the land as a patchwork of independent resource units. And there will be more factors involved in land-management decisions.

Besides controlling erosion, conservationists and clients will consider other societal concerns such as viability in production agriculture, cost of farm subsidies, water quality and quantity, food safety, waste management, and biological and ecological diversity. Computer-driven technology will help make this possible.

The key to good land-management decisions is good technology based on good science. To benefit from this technology, SCS staffs must:

- Understand their customers' needs;
- Have a vision or goal of using available technology;
- Invest time and money to plan and build a technology system that is "right" the first time, and then monitor its effectiveness; and
- Have a qualified work force to deliver the technology.

Since the 1985 Food Security Act, the percentage of the farm population seeking help from SCS field personnel has jumped dramatically.

SCS clients are more varied than ever before, and many are adopting practices unfamiliar to them, such as crop-residue management, to meet conservation compliance requirements. Increasingly, these clients want assistance in the form of software and data bases for their computers.

SCS's "vision" is to have a highly automated field operation. Conservationists in the field offices will have instant access to resource data and interactive communication links between clients, other technical experts, and data bases.

Through automation, the field office technical guide—SCS's primary delivery mechanism—will take on an expanded meaning and usage. It will be an archive of institutional memory—yet it can be stored efficiently on optical disks that offer portability.

Some sections of the technical guide will take the form of electronic data bases. Others will become an "expert system." This is a computerized pool of expert knowledge that provides information, through a Q&A format, on conservation and management alternatives for a piece of land.

Already, the technical guide has evolved into a comprehensive mechanism that addresses the en-

Benefits of the disk reader are enormous...SCS hopes its entire directives system and its entire soils description system will eventually be on CD-ROM.

tire spectrum of technical needs—in a way never before done.

In 1991, field offices started using engineering software (FOES). They also use the geographic information systems (GIS) software, GRASS, which stands for geographic resources analysis support system. In the field office, GRASS will interface in the field office with the field office computing system (FOCS) to support an approach to the use of GIS technology that is user-friendly and application-oriented. Also installed were modules of the national soils information system (NASIS) and the ecological sciences information system (ESIS).

The first phase of the water erosion prediction project (WEPP) will be used by field offices in 1995. WEPP is a new technology that is landscape-oriented and process-based. It will replace the universal soil loss equation (USLE).

To build a deliverable technology, SCS is expanding and improving its "conservation toolkit" by adapting a systematic, interdisciplinary approach. SCS's goal is to have all software fulfill a real need, work right the first time, and have a common "look and feel."

Computer-assisted design and drafting (CADD) involves a straightforward transition. In other cases, geographic information systems (GIS) provide a new view on how to do business.

GIS expands one's vision of the landscape and its components. It provides a three-dimensional "look." And it will become a fundamental technology for implementing total resource management planning.

GIS will provide a format to launch effective service to conservation customers facing myriad challenges. The GRASS GIS software that SCS adopted already is being run on computers in more than 100 State and field offices.

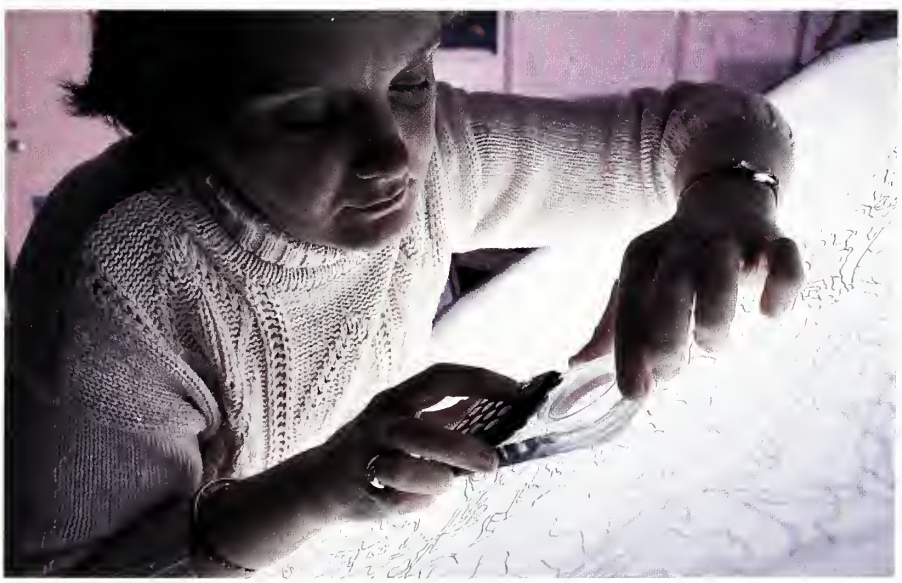
Also essential to SCS's planning decisions with its customers are

Models Used in SCS Planning Decisions

Among those models significant to SCS's work are:

- WEPP, the water erosion protection project;
- RUSLE, the revised universal soil loss equation;
- WEPS, the wind erosion prediction system;
- EPIC, the erosion productivity impact calculator for the resource evaluation toolkit;
- FOES, the field office engineering system;
- CARE, the cost and return estimator for economic and environmental decisionmaking;
- ESIS, the ecological sciences information system, including GLA (grazing lands applications), windbreak, and forestry modules;
- CED, the conservation effects for decisionmaking model;
- SPUR, the simulation of production and utilization of rangeland for range hydrology;
- CREAMS, the chemicals, runoff, and erosion from agricultural management systems for water quality and pesticide determinations;
- NLEAP, the nitrate leaching and economic analysis package;
- SWRRB, the simulator for water resources in rural basins; and
- AGNPS, the agricultural nonpoint source pollution model.

This list barely skims the surface of important advances in everyday office use of models for the physical and social sciences.



Christine Clarke, SCS GIS specialist, demonstrates how county soils layer information is digitized for use in an SCS field office GIS. (Tim McCabe photo; 0792-03)

models, especially physical-process models. They help SCS conservationists understand on-farm economics, agrichemical use and costs, water quality, soil erosion, and even the effects of social structure and attitudes. (See models listing p.5.)

The compact disk-read only memory (CD-ROM) is an optical disk reader attached to a computer; it is state-of-the-art technology for storing and retrieving massive amounts of information that SCS employees need to support and run these models.

Benefits of the disk reader are enormous in terms of the quantity of data stored; ease of access and retrieval of information; and reduction of paperwork, manuals, and filing. SCS hopes that its entire directives system and its entire soils description system will eventually be on CD-ROM.

One of the more forward-thinking challenges for SCS involves building better data bases. Among the bright spots in the area of data collection so far are:

- SCS's new climate data base built around its centralized forecasting system;
- The interagency data-coordinating effort for GIS;
- Pesticide data bases that help us determine the fate of these chemicals after application;
- SCS's new soils information system, NASIS; and
- New global soils data bases to help assess the feasibility of conserving and sequestering atmospheric carbon by managing terrestrial ecosystems.

Orthophotography is one of SCS's greatest data needs. Most of SCS's work is still done on aerial photos, which are not georeferenced correctly. Digital orthophotography will become the common base for planning and will help solve problems such as reconstituting field and farm boundaries, all using GIS technology*.

SCS will build an even better quality delivery system by enhancing the knowledge of the SCS staff who deliver the system. And SCS will stay attuned to the changing requirements of the work and the work force for the present and the future. Farming, ranching, and conservation district operations will be much more diverse in the 21st century.

Good land management—in policy and practice—needs a partnership of:

- Land users committed to using the best technology available for total resource management;
- A technology delivery team that is visionary, committed to customer service, and capable of multidisciplinary approaches to resource management; and
- A society willing to base its environmental policies on good science and to invest in the right technology.

* See related article, page 15.

Robert R. Shaw, deputy chief for technology, SCS, Washington, D.C. This article is based on his oral presentation at the Soil & Water Conservation Society's 1991 annual meeting in Lexington, Ky. The Society's *Journal of Soil and Water Conservation* published his presentation in more detail in its November-December 1991 issue.

Colorado's Hi-Tech Building Boom

"THE NEWEST kid on the block" in the Soil Conservation Service "family" was born because of today's age of sophisticated technology, then borne to the Colorado mountains at Fort Collins. The kid is named TISD, and it is building a TECHIS.

The technology information systems division (TISD) will plan, design, build, and maintain the agency's technology information system (TECHIS), one of four major SCS information systems.

TECHIS includes computerized aspects of programs used in such SCS areas as cartography (and its geographic information system), ecological sciences, economics and social sciences, engineering, international conservation, resources inventory, and soils.

TISD is actively working on 20 national software projects. They include the:

- National soils information system (NASIS);
- National resources inventory (NRI) information system;
- Grazing land applications (GLA);

FOES will save time and money and eliminate duplicative efforts. SCS staffs can use it on existing field office computer equipment.

• Water erosion prediction project (WEPP);
• Conservation practice physical effects; and
• Field office engineering software (FOES).

At its Colorado site, TISD works with information resources management and programs system division staffs at Fort Collins to set up information systems for SCS use at all organization levels. Cooperatively, they work on systems integration, training, equipment acquisitions, and information standards.

Structurally, TISD has five primary teams: technology support, data base development, decision support models, practice design, and system building and support. They work on technology and software development projects.

A project manager plans and guides each project. TISD gets assistance from other SCS offices and from contractors as needed.

Environmental technology and information technology are inseparable in this "age of automation." SCS acknowledged this by creating TISD. And the TECHIS being built by the TISD "kid" will help SCS employees meet their customers' service expectations more quickly and with superior, computerized tools.

Bernard A. Shafer, TISD director, SCS, Fort Collins, Colo.

FOES Helps Design Practices In a Minute

A NEW AND BETTER conservation planning tool is the field office engineering software (FOES) that allows Soil Conservation Service planners to design engineering practices on a computer screen in just a minute instead of taking an hour or so to draft them on the drawing board.

FOES will save time and money, and eliminate duplicative efforts. SCS staffs can use it on existing field office computer equipment. They can use it for engineering measures described in Food Security Act conservation compliance plans.

The first FOES products were created in 1991. Planners can now design erosion control practices, such as terraces, diversions, grassed waterways, water- and sediment-control basins, and underground outlets.

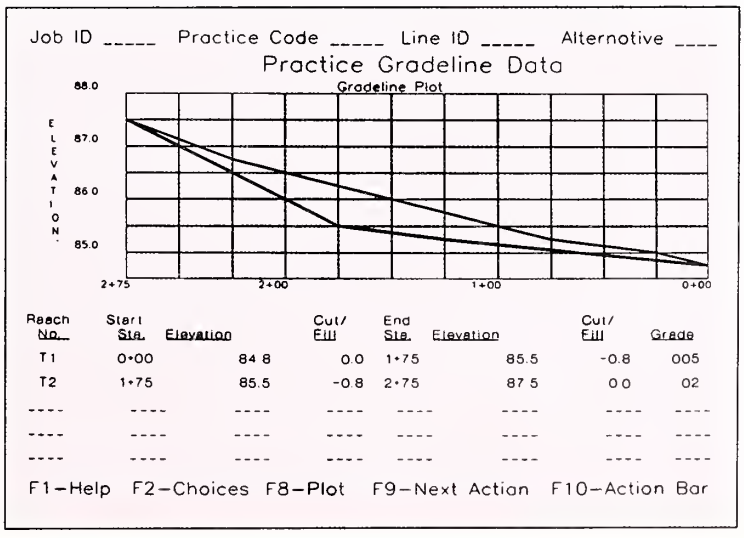
The software also automates the complete basic engineering activities: surveying, hydrology, hydraulics, earth sciences, and engineering plans.

In a screen display (below) of a planned grassed waterway, the upper line is the existing ground line and the lower is the planned grade.

Additional FOES being developed by technology specialists in Fort Collins, Colo., will contain waste and water management practices to assist with water-quality activities.

FOES helps SCS and soil and water conservation districts have the best possible tools to meet the challenges they face now and in the future.

Scott D. Snover, team leader, SCS, Ft. Collins, Colo.



FOES makes extensive use of graphics for both display and output. (SCS computer image; 0792-04-l.a.)

FOCS and SOILS To Help Field Office Planners

THE SOIL Conservation Service is scheduled to begin installing the field office computing system (FOCS) in its field offices by late 1993. A part of FOCS will be the soils data base (FOCS/SOILS) that provides soil characteristics for various automated uses.

With FOCS and FOCS/SOILS, the agency's conservation planners can work more effectively with farmers and ranchers by using decision tools that evaluate the impact of practices on soil, water, plant, animal, and human resources.

Using FOCS, the planner and the client describe the current (or benchmark) farming operations, including conservation practices previously applied. Then, for example, they can evaluate the effect of the benchmark on sheet and rill erosion and on wind erosion. The SCS conservationist uses computer programs for the revised universal soil-loss equation (RUSLE) and wind erosion equation (WEQ).

Next, they adjust or add practices to the computer image of the current or benchmark operations to create a possible new farming system. Then they generate soil-loss values based on these changes. The difference between the new system and the benchmark operations is called impact—it's useful for making decisions to conserve soil.

To create FOCS/SOILS, the map unit record is combined with the soil interpretations record to create a map unit interpretations record. Called MUIR, these data are in tables that store information for individual map units and map unit components of soil survey areas.

Requested MUIR tables will be created at Iowa State University and then electronically sent to soil survey data bases at State offices. State office soil scientists will review and tailor the data to fit local conditions. Then data are downloaded to field offices for use in FOCS.

MUIR will also provide soils information for a geographic data base for the soil survey area, and for manuscript tables in publications.

Computer specialists at Fort Collins, Colo., are preparing various technology software programs that have a full package of services available for SCS offices.

These services include: on-farm water budget; grazing land applications (GLA), including forage balance, grazing schedules, herd calculation, and ranch economics; soil condition evaluation; nitrate leaching and runoff; animal waste management; wildlife habitat; conservation practice cost and returns; cultural resources; and wetland presence and conditions.

Contributing to this article were SCS employees **Jack Carlson** and **David Anderson**, team leaders, and **Paul Fuglestad**, project manager, Ft. Collins, Colo.; and **Paul G. DuMont**, associate editor, *Soil & Water Conservation News*, Washington, D.C.

USDA Agricultural Research Service scientists measure cropland erodibility near Cottonwood, S. Dak., using a rainfall simulator. Data will be incorporated into a new erosion prediction system called water erosion prediction project (WEPP) that will replace the universal soil loss equation (USLE). (Tim McCabe photo; 0792-05)

Laboratory Technology

Mobile Labs Help Farmers Conserve Water

Spray jet emitters deliver the precise amount of water needed to reach the root zone of new citrus trees. As the trees grow, the emitters are changed. (Art Greenberg photo; 0792-06)

BRINGING SERVICES to people probably peaked with the home delivery of milk and bread. In a new twist to this old concept, Soil Conservation Service technicians in Florida are taking technology to people. Technicians use their expertise and the equipment in two laboratories on wheels to help citrus and vegetable growers improve irrigation efficiency and conserve water.

Evaluating irrigation efficiency on a farm-to-farm basis in Florida began in 1987 with an SCS partnership with the Southwest Florida Water Management District. In 1988, SCS started another partnership with the South Florida Water Management District (SFWMD). These districts now fund one mobile lab each, under 3-year renewable contracts, at a cost of about $80,000 per year.

Their action translated into 6.2 billion gallons of water once wasted now being conserved yearly. At that rate, the program costs about 4 cents for each 1,000 gallons saved. SCS and SFWMD are talking about starting a third mobile lab.

"Agricultural growers from freeze-damaged areas further north in Florida are moving south of Lake Okeechobee into areas that have water supply problems," explained Bruce Adams, water conservation coordinator for SFWMD's office of communications. "Citrus acreage during the last few years has doubled—and in some areas, nearly tripled—in counties where one of the mobile labs is operating."

"The mobile lab team can assist water users by determining the costs and methods to improve management of existing systems or convert to higher efficiency systems," noted Calvin Hubbard, SCS soil conservationist, who serves as leader of the mobile lab team operating from the Immokalee, Fla., field office.

The water districts require that low-volume, high-efficiency irrigation be used on new citrus and vegetable crops. They borrowed the mobility concept from California, where mobile irrigation labs operate in partnership with resource conservation districts.

Florida mobile teams evaluate both high- and low-volume irrigation systems for use on citrus crops, vegetables, and nurseries. On the site, the team records soil type, crop, water requirements, particulars of the pump and irrigation system, the frequency and duration of the watering cycles, and other details. After a usual 3-day turnaround time, the landowner is

given a complete report of each analysis.

Revisiting 10 percent of their customers after 3 years, the Immokalee team found that all landowners followed planned irrigation schedules and/or implemented their suggested improvements, resulting in 140 percent of the predicted water savings.

Using what you have efficiently is the name of the game in irrigation. If a grower using overhead sprinklers can afford to convert to low-volume drip or spray jets, SCS will help design the system.

Looking at all irrigation water users in Florida, however, diligent moisture monitoring and accurate irrigation scheduling may conserve more water than changing irrigation systems. The mobile labs are set up to give irrigation water users detailed information to provide their crops with the precise amount of water needed.

Calvin Hubbard, SCS soil conservationist, with the Immokalee, Fla., field office, checks irrigation water pressure at the spray jet emitter as part of his evaluation. (Art Greenberg photo; 0792-07)

Keeping pumps efficient through maintenance saves fuel and water and ensures the uniform delivery of water and the fertilizer that is often mixed with it. (Art Greenberg photo; 0792-08)

"The big advantage of the mobile lab program is that we can focus on specific irrigation problems," said David Sleeper, SCS soil conservationist, Wauchula, Fla., and a mobile irrigation lab operator. "There's a future for mobile labs for many years to come."

Art Greenberg, regional information officer, South National Technical Center, SCS, Fort Worth, Tex.

Focus on Diversity

SCS Focuses On Diversity Suggestions

FLEXIBLE work policies and employee networking have now been implemented at Soil Conservation Service offices around the country, based on recommendations of the November 1990 SCS Work Force Diversity Conference. SCS State conservationists have been encouraged to make use of flexible personnel policies.

Many of the suggestions, including the flexible work place, flexible tours of duty, and a flexible leave policy, were repeated in last year's followup Work Group Summary Report.

An SCS task force was formed to further debate ways to increase diversity. As a result, SCS national policy now encourages the development of networking groups that benefit all employees. Mentors, or sponsors, are being found for new employees to provide information about the work situation and ideas on job placement for an employee's spouse.

Acting on the recommendation to identify and develop new career opportunities, SCS uses an interdisciplinary series to advertise positions at multiple grade levels. In many instances, the areas of consideration for vacancy announcements have been expanded to

Boys Town, SCS Link Up

Students from Boys Town High School will work part-time for the Soil Conservation Service under a cooperative agreement between SCS and Boys Town's Youth Employment Services.

Senior Juanita Montez is the first beneficiary of the program. She is working part-time for SCS while completing her senior year at Boys Town High School in Omaha, Nebr. Her job, which includes training on conservation layout and design practices, is an outgrowth of her previous SCS summer job and her high school agricultural studies. After high school, Montez will have a chance at a full-time career training position with SCS.

"Boys Town's agricultural and horticultural programs provide the training we want our future employees to possess," said Paul Sweeney, district conservationist, Omaha, Nebr., the SCS liaison with Boys Town.

High school co-op student Juanita Montez at work for SCS in Nebraska. (Mitch Keebler photo; 0792-09)

Sweeney played a large part in setting up the cooperative education program.

"We're looking to bring up some quality employees," noted Sweeney about the program.

Pat McGrane, public affairs specialist, SCS, Lincoln, Nebr.

At a regional Work Force Diversity conference held in Lincoln, Nebr., employees of the SCS Nebraska State office and the Midwest National Technical Center consider the issues. (SCS photo; 0792-10)

departmentwide, governmentwide, and all sources.

To create a more diverse SCS work force, letters and vacancy announcements will be sent to the Hispanic Association of Colleges and Universities and to the 1890 land-grant colleges and universities to provide information on agency career opportunities.

Following up on an expressed need, SCS senior managers received diversity training in March and during one regional meeting. All SCS employees will receive cultural sensitivity training and training to develop small-group interaction skills.

Cultural diversity issues will be added to the management excellence series, while the pilot course "Preparing for the Diverse Workforce of the Future" will be revised and then made available to managers and supervisors on a continuing basis.

SCS employees are stretching to reach their diverse customers. Pilot outreach projects have been targeted to limited resource farmers, as well as groups of Native Americans, Asian-American orchard owners, and African-American small-scale farmers. In addition, a video on communicating with culturally diverse clients was released.

As SCS efforts continue, the agency is well on the way to a more diverse work force and improved methods of delivery to its diverse customers.

Mary Jo Armstrong, associate editor, *Soil & Water Conservation News*, SCS, Washington, D.C.

Florida Gains Diversity

THE HISPANIC American Cultural Effort (HACE) has recognized the Soil Conservation Service Florida State office for its support of the Hispanic Program and its success in recruiting Hispanic employees.

Less than 4 years ago, the Florida State office had three Hispanic employees; now it has eight, which include a female Hispanic cooperative education engineering student. The office hired several soil scientists from Puerto Rico.

At the U.S. Department of Agriculture Hispanic Symposium in Miami, SCS employees talked to hundreds of high school and college students. As a result, several students became SCS volunteers to learn more about agriculture.

Last year, Paul Pilny, then acting public affairs specialist, SCS, Gainesville, Fla., and Juan Vega, resource soil scientist, SCS, Palmetto, Fla., joined forces to prepare and present bilingual English-Spanish workshops for students in elementary school through high school. Workshop participants talked about soils and natural resources; one workshop was held outdoors in a forest setting.

"We tried the idea and it was very successful," noted Pilny. "So we continued it and expanded the service to offer the program statewide." In addition, the team made a bilingual presentation to the Spanish-American Club of the five-county area of west-central Florida.

Mary Jo Armstrong, associate editor, *Soil & Water Conservation News*, SCS, Washington, D.C.

Employees at the SCS Raleigh, N.C., State office celebrated Hispanic Heritage Month with a colorful luncheon with Hispanic menu items such as sopapillas. Staff members also created a wall display with pictures and biographies of outstanding Hispanic-Americans and a Hispanic cultural museum of music, craft work, flags, and other articles. (Andrew Smith photo; 0792-11)

Black Farmer Finds Opportunity

Melvin Shepherd, a Missouri farmer, is also a conservation leader. (Charlie Wright photo; 0792-12)

MELVIN SHEPHERD is one of those people who seem to be able to remember the past without dwelling on it, to be concerned about the future without worrying excessively about it, and to live in the present successfully.

"Back when I was a kid," Shepherd recalled, "there were quite a few black farmers in northeastern Missouri. Then most of the young people went to the cities to go to work. And most of their parents who remained have passed away."

Shepherd was born and raised on the land he owns. Now only 1 percent of his fellow farmers in Pike County are black. He believes the reduction is partly due to many black farmers having quit farming as a livelihood.

The scenario is in keeping with national trends. In 1920, one of every seven U.S. farmers was black. In 1982, only one of every 67 farmers was black.

But Shepherd thinks there are more opportunities than ever for young blacks in agriculture. "There are a lot of different fields under agriculture. There are even agriculture-related jobs in the cities," noted Shepherd. "I don't think that's brought out."

Getting more young black people to think about agriculture careers will require educating them about the possibilities, Shepherd believes. "They need to learn in high school, or before if possible, that there are opportunities in agriculture," he said.

As an elected member of the Pike County Soil and Water Conservation District board, Shepherd holds one of the most responsible positions in the farming community. He and his fellow board members must approve farmers' conservation compliance plans, as well as decide which farmers are eligible for financial assistance to implement their plans.

Shepherd feels lucky to have had the opportunity to learn about agriculture and conservation the hands-on way, by growing up on a farm. "I left the farm once and went to the city," he recalled. "But I came back. I missed the farm."

Shepherd's farm has been in his family for more than a century. His great-great-grandfather was a slave in northeastern Missouri, and his family remained in the area. The home farm is now 507 acres, but Shepherd recalled that his family once farmed about 2,000 acres.

"My grandpa always did a lot of conservation work around the place," Shepherd said. "I remember seeing him install soil conservation measures when I was a kid." Following in his footsteps, Melvin Shepherd is a conservationist and a leader, as well as a farmer.

Charlie Rahm, public information specialist, SCS, Columbia, Mo.

Landowner Trades Crops For Trees

WOODLAND management replaced row-crop farming for Margaret Coleman, of Saluda County, S.C., who took the Soil Conservation Service's advice on maintaining her land and keeping it in good condition.

After the death of her husband, Coleman took over management of their land. She was referred to SCS for help by a private forestry consultant. She began working with Dan Guy, SCS district conservationist for Saluda County.

In 1987, Coleman signed a long-term agreement with the U.S. Department of Agriculture to plant part of her land with pine trees. Under the plan, SCS designed 46 water bars (ridges across a road to divert rain water to one side) to protect the woodland dirt roads from erosion. The agreement also covered management of all of her established woodlands.

A year later, Coleman became interested in Food Security Act provisions that encourage landowners to take highly erodible land out of production. Through the Conservation Reserve Program, she planted loblolly pine trees on some of her former cropland.

A compliance plan drawn up for land that she rented to others specified contour farming, cropping sequences, and crop residue management. Today all of her land is covered by a conservation plan.

"I come to Dan [Guy] with problems and get the help I need. Also, I'm learning," Coleman remarked about her dealings with SCS.

In response to Coleman's concern for wildlife benefits, SCS helped her establish plantings for quail, deer, turkey, and rabbits. Bahai grass strips were planted along with the pines to provide wildlife habitat.

Coleman summed up, "The Soil Conservation Service has been very cooperative. If I hadn't had the help, my land would have gone to waste."

Debbie Cribb, public affairs specialist, SCS, Columbia, S.C.

Dan Guy, SCS district conservationist, shows landowner Margaret Coleman the damage moths caused to the bud of a young pine tree. (Debbie Cribb photo; 0792-13)

Field Office Technology

Orthophotos To Cover the Continent

DIGITAL orthophotos are very accurate photo image maps. They show all features on the earth's surface in their true geographic positions. The Soil Conservation Service will use this type of photography as the standard base map for field use in 48 conterminous States.

SCS, the Agricultural Stabilization and Conservation Service (ASCS), and the National Mapping Division of the U.S. Geological Survey (USGS) are working together on this orthophotography effort. It will help share resource information more efficiently among USDA agencies and with other Federal, State, and local agencies.

For 50 years, SCS has used traditional aerial photographs. Soil scientists mapped soils with them. Conservation planners plotted farm field lines, wetlands, highly erodible lands, and other resource data on them. Aerial photographs served their purposes well.

However, current USDA methods of collecting and using geographic information from aerial photographs do not lend themselves to sharing and automating the data. Data are being collected on different kinds of maps at different map scales. Soil map bases are now required to be orthophotos, but that still usually differs from maps used for conservation planning.

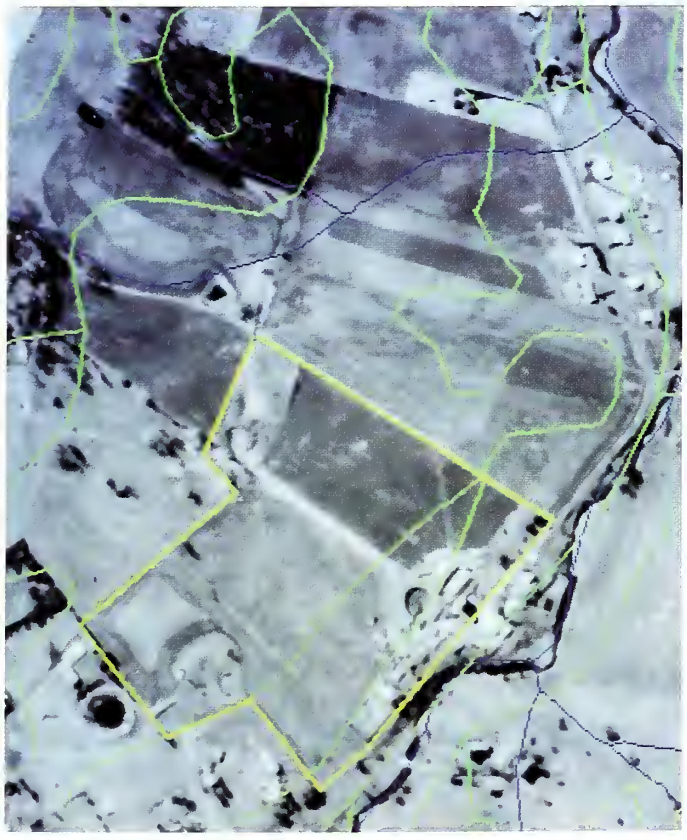
For ASCS and SCS, the orthophoto will keep mapped resource information—farm and field boundaries, highly erodible lands, wetlands, and other types—organized on a common, accurate base map. USGS will use the orthophoto to revise the 1:24,000-scale National Digital Cartographic Database.

A digital orthophoto is made by scanning an aerial photograph to convert the image into digital information in the form of pixels. Digital elevation models, camera parameter information, and horizontal coordinates of ground points are then related to the pixel coordinates, and a transformation of the pixels is carried out in a high-speed processor.

The transformation removes the image displacement and scale inaccuracies of an aerial photograph; in doing so, it creates a digital orthophoto image at 1 meter ground resolution.

SCS has begun to automate the mapping, analysis, and management of natural resource data at its field offices using the geographic information system (GIS) software, GRASS, which stands for geographic resources analysis support system.

In the field office, GIS digital orthophotos can be used (1) as backdrop images for conservation plan maps and for orientation when dealing with agricultural pro-



Digital orthophotography, displayed as a base layer in the GIS, allows users to combine it with a variety of land features. A portion of Rockingham, Va., is displayed with stream and drainage areas outlined in blue, soils delineations outlined in green, and a specific farm boundary outlined in yellow. (Tim McCabe photo; 0792-14)

With a traditional aerial photograph of Rockingham County, Va., Bill Patterson, SCS district conservationist, center, and Ceasor Johnson, SCS soil scientist, right, assist farmer Lowell Ulrich by suggesting conservation measures to improve the Ulrich farming operation. Visualizing such results on the land is easier when digital orthophotography is used. (Tim McCabe photo; 0792-15)

A United States county in the palm of your hand! Digital orthophotography maps can be stored on convenient disks (like this CD-ROM) for field office use. (Tim McCabe photo; 0792-16)

ducers; (2) as hardcopy base maps for mapping and digitizing soils and other data; and (3) to quickly change field boundaries, and other resource sites with on-screen digitizing. Hardcopy products can be outputed at a desired scale or format. Accurate measurement of acreages and distances can be made from the orthophotos.

Storage of the digital orthophoto can be on read/write optical or CD-ROM disks. An average of six disks will cover one county of orthophoto digital imagery.

Commercial mapping companies, with managerial leadership from a Federal steering committee, are scheduled to begin orthophoto production in 1993. One-fifth of the country will be mapped each year, with an anticipated completion by 1998. A 10-year repeat cycle is planned to keep the orthophotos current.

George M. Rohaley, GIS and remote sensing national coordinator, SCS, Washington, D.C.

Testing GRASS in The Field

FOR THE PAST year, the Soil Conservation Service in Wisconsin's Dunn County field office has been testing GRASS as a part of the geographic information system (GIS) software on a field office project to manage land resource data.

GRASS is an acronym for the geographic resources analysis support system and SCS's choice for GIS software.

The purpose of the field office project was to explore:

- Hardware and software compatibility;
- The feasibility of electronic data sharing;
- Multiuser capability; and
- The workability of GRASS in a field office.

Compatibility: Of necessity, the GRASS project ironed out solutions

"This system makes aerial slides instantly accessible, and reduces retrieval time from days or minutes to a fraction of a second," said Conners.

to major problems with hardware, software, and data sharing. The SCS staff at the South National Technical Center, in Fort Worth, Tex., provided long-distance troubleshooting through the GRASS hotline in the cartographic center.

Data Sharing: Rick Mechelke, GRASS project coordinator in Dunn County, found it was easy to import data from private vendors, Federal sources, and other agencies. The difficulty was in exporting data, particularly raster-type (grid-fill) data, to other users. Data exchanges build GIS layers, which are useful to all users.

Multiusers: Eventually, when data layers are available for the entire county, work stations can be added for other staffs to access GRASS.

Field Office GRASS: Mechelke has tested GRASS and has shown its potential for useful field office operations to make highly erodible land (HEL) determinations, develop conservation plan maps, and determine percentages of soil types on a field.

The project was funded through an agreement with SCS; the Wisconsin Department of Agriculture, Trade and Consumer Protection; the Dunn County Land Conservation Department; and the River County Resource Conservation and Development Council.

SCS is also testing GRASS as a component of an automated, countywide land records system. All Wisconsin counties must have a plan to modernize their land records by July 1992, and GRASS will be a key part of the Dunn County effort.

In a watershed study, Mechelke was able to estimate the total phosphate load to Tainter Lake and then identify which watersheds were the biggest contributors. To do this, he obtained land-use maps and satellite imagery and located all the barnyards within the watershed. Now, watershed planners can pinpoint the biggest sources of phosphate pollution.

Through GRASS, Mechelke developed a disaster evacuation plan around an industrial plant with potential hazardous waste discharge.

"We learned three important lessons," according to Mechelke. "First, the Dunn County GRASS project has demonstrated that good orthophotographic base maps are essential to a working system; second, extensive training is needed; and third, at least one full-time person dedicated to developing a field office installation is required. After 1 year, the project is going well. GRASS has tremendous potential."

Renae Anderson, public affairs specialist, SCS, Madison, Wis.

Optical Disk Technology Saves Time and Money

Optical disk technology has relieved the Soil Conservation Service's Madison, Wis., field office of the time-consuming tasks of retrieving, loading, and storing aerial slides.

The Madison field office staff use aerial imagery to check crop histories, wetlands, and land use for the Conservation Reserve Program, "swampbuster," "sodbuster," the National Resources Inventory, and other U.S. Department of Agriculture programs. Aerial photos are taken every year and can fill dozens of boxes and slide trays.

Recently, Kevin Conners, a county conservationist with the Dane County Land Conservation District, implemented a pilot optical disk system to reduce staff time spent on slide storage and retrieval. In 1 week, SCS and the county staff transferred 35mm slide images to a WORM (Write Once Read Many) optical disk.

Each disk has a 72,000-image capacity; 10 years' worth of Dane County's slides used 20,000 images.

A program was developed using a commercial data base to build a table connecting the Agricultural Stabilization and Conservation Service tract number to the image address. This gives employees the capability to look up a tract of land and, with two key strokes, have the aerial photograph appear.

To run the system, Conners uses a color video monitor and an optical disk player that connects to the field office's minicomputer. The operator can use the arrow keys to move east, west, north, or south; to move to other tracts on different slides; to zoom in to a quarter-section of a tract; or to move backward and forward through 10 years of photos.

"This system makes aerial slides instantly accessible, and reduces retrieval time from days or minutes to a fraction of a second," said Conners.

Renae Anderson, public affairs specialist, SCS, Madison, Wis.

Using Water Wisely

USDA Works For Water Quality

"WE PLAN to educate landowners on specific practices they can install to reduce contamination of surface and ground water," said Ken Rismeyer, Soil Conservation Service project coordinator for the St. Peter—Prairie du Chien—Jordan Aquifer hydrologic unit area (HUA) in southeastern Minnesota.

"The first phase of this 5-year U.S. Department of Agriculture (USDA) water quality initiative involved 112 farmstead visits," noted Jack McGill, Minnesota Extension Service (MES) water quality technician. "We discussed important factors, such as where the farm's well and animal waste facility are located, the types and amount of fertilizers and chemicals used, and where and how manure is stored and spread."

The HUA farmstead visits provided data which will be used to evaluate progress toward accomplishing the project's objectives. "The main focus of the project is to improve and protect the quality of the surface and ground water through the implementation of structural measures," said Rismeyer.

The HUA is set in a unique area of karst (limestone) topography that lends itself to cracks and fissures in the bedrock, allowing surface contaminants to enter some ground-water systems without first being filtered out through natural processes.

Other areawide contributors to ground-water contamination are sinkholes. In some cases, sinkholes provide contaminants a direct pathway to ground water.

"Because of the potential for severe contamination to the ground water, the Minnesota Pollution Control Agency approved a clean water partnership for the same six Olmsted County townships where the USDA's HUA is located," said Terry Lee, Olmsted County water planning coordinator.

The partnership is concentrating on protecting the wellhead areas for the wells that provide water to the city of Rochester. Efforts in the HUA and the partnership are coordinated through a monthly meeting of the local water quality management team.

The HUA has received 97 requests for long-term agreements, with about 25 percent of these involving animal-waste storage facilities. The other requests involve the construction of terraces, dams, diversions, water and sediment control basins, and grassed waterways.

Almost 2 years into the project, use of integrated crop management was approved as a cost-share practice in the hydrologic unit by the Agricultural Stabilization and Conservation Service (ASCS).

"We are now able to include nutrient and pesticide management planning as a cost-share item in long-term agreements," said Rismeyer.

"The amount of cost-share a landowner may receive is $35,000," noted Rich Bauer, ASCS's county executive director for Olmsted County. The length of a long-term agreement in the HUA is determined by the contribution the agreement will make toward meeting the project's goals, up to a maximum of 10 years.

"Three of our five board members live in the hydrologic unit area," pointed out Laurie Hassler, district manager for the Olmsted Soil and Water Conservation District (SWCD), Rochester, Minn. The board members, the first to be contacted by MES for the 45-minute farmstead visits, were able to offer early suggestions for improvement in the district's first ground-water project.

Rismeyer discusses the HUA with the Olmsted SWCD board at their monthly meetings. "In the case of the St. Peter—Prairie du Chien—Jordan Aquifer HUA, the high level of cooperation between the USDA agencies and the local SWCD has been excellent," he said.

Mary Jo Armstrong, associate editor, *Soil & Water Conservation News*, SCS, Washington, D.C.

As May progressed, the woods along the creek were alive with the songs of thrushes, vireos, and warblers.

Reservoirs Spin Off Bird Life Benefits

The article "Birds of the Flood Control Reservoirs at Rochester—Interim Report" by **Anne Marie Plunkett** was published in *The Loon* in winter 1990. It is reprinted with permission and has been adapted to meet the needs of this publication. The reservoirs she visited to conduct a bird census are the products of Soil Conservation Service flood control work in the South Zumbro Watershed, Olmsted County, Minn.

Eastern bluebirds nested at the reservoir sites in Olmstead County, Minn. (George Jett photo; 0792-17)

IT IS NOW 7 months since I first unlocked the gates to the flood-control reservoirs WR 6A and WR 4 to begin a 2-year assessment of avian usage for the South Zumbro Watershed Joint Powers Board, which administrates the areas. This is an interim report.

The land owned by the city [Rochester] and the county [Olmsted] surrounding the lakes encompasses 229.8 and 202.3 acres. Because both reservoirs were off limits to the public, they provided me an excellent opportunity to observe the diverse usage afforded by an integral landscape.

Between 20 April and 30 November 1990, I have observed 159 species of birds during 130 hours and 75 visits. Of these, 152 species were recorded at reservoir WR 6A, and 97 species at reservoir WR 4.

Given that the bulk of the spring migration of waterfowl had already gone through by the time I began this study, and considering that this study does not yet include our winter birds, I think that the total number is high.

I think I can safely say that I know of nowhere in Olmsted County where such a large number of different species of birds use one given area for their year-round homes, for nesting, for feeding, or for a stop-over during their spring or fall migrations. I think this is true because of the biological diversity of both sites and the mix of diverse habitats.

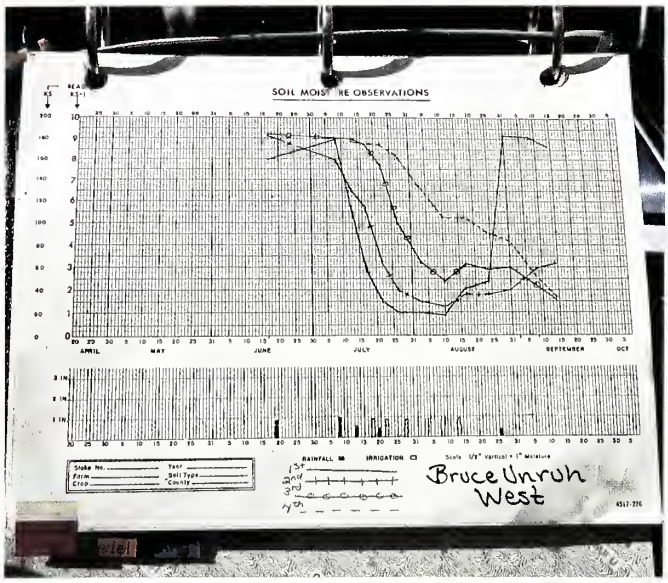
The first two birds which I saw on 20 April 1990 were a peregrine falcon (an "endangered" species) ... and an immature bald eagle (a "threatened" species) ...—not a bad start!

On the WR4 reservoir was a mix of waterfowl, with common and black terns skimming the water. Three double-crested cormorants were continuously present.... Great blue herons, great egrets, and green-backed herons had all arrived for the summer, as had our usual five species of swallows. As May progressed, the woods along the creek were alive with the songs of thrushes, vireos, and warblers. Eastern bluebirds seemed to be everywhere.

At WR 6A in late spring and early summer, there were 21 migrant species, 64 summer residents, and 21 permanent residents. There were 23 nesting species (of which three, pied-billed grebe, green-winged teal, and green-backed heron, have not previously been recorded as nesting in Olmsted County).

Perhaps now it is evident why I think of WR 6A as a logical laboratory for students of wildlife.

Conserving Colorado's Ogallala Aquifer



Gypsum block readings are plotted on a graph to tell farmers when irrigation is needed. (Wes Robbins photo; 0792-18)

"I DIDN'T understand how something the size of a marshmallow could save me $10,000 in pumping costs the first year I used it," exclaimed Bruce Unruh, a northeastern Colorado farmer.

The "marshmallow" that is helping Unruh and other irrigators use water more efficiently is the gypsum block. It is one of the tools being promoted by Soil Conservation Service conservationists to slow the depletion of the Ogallala Aquifer.

SCS established the Ogallala Water Management Office in Burlington, Colo., in 1983 to study and combat the aquifer's steady decline that was averaging between 1/2 and 2-1/2 feet per year. Northeastern Colorado also received project funding from the Agricultural Stabilization and Conservation Service, as well as assistance and funding from the Energy Conservation for Colorado Agriculture group.

"A farmer must understand water output before being able to understand soil intake," summed up Wes Robbins, SCS Ogallala office coordinator.

Staff members at the Ogallala office offer help with irrigation water management. Assistance begins with a pump and center pivot efficiency evaluation. Water-holding capacities and soil textures of each field are discussed with the farmer.

Overwatering fields can cause chemicals to leach beyond the root zone into the water table. Runoff can carry chemicals into lakes and rivers.

To prevent overwatering, the gypsum block is used to monitor irrigation water application. Small blocks of the mineral are buried in the crop's rooting zone, usually 1 to 4 feet deep. Leads attached to blocks connect to a voltage source and an electrical resistance meter. Electricity is applied through an electrode.

When it is very wet, gypsum has a low electrical resistance. As it dries, its resistance increases. By using this difference, and plotting meter readings at 1-foot intervals, farmers can determine exactly when irrigation is needed.

"We stopped irrigating when the gypsum blocks told us our profile was full, and we harvested on dry soils, giving us the highest harvest weight ever," said farmer Bruce Unruh.

Usually, one to three blocks are placed in each field and are "read" once a week.

"The gypsum blocks showed me that I was not getting water percolation deep into the soil profile," noted Fred Wedel, a Burlington-area farmer. "My surge valve had been set on a 24-hour schedule. I changed it to 48 hours and reduced my pumping costs by $1,000."

With gypsum blocks, and a combined program of ridge tillage, soil probing, pump and center pivot testing, and the installation of low-energy precision application nozzles on center pivot systems, SCS is helping rejuvenate irrigated farming in northeastern Colorado.

Lorraine Peavy, public affairs specialist, SCS, Lakewood, Colo.

NEWS Briefs

New Mexico Converts to CADD

The Soil Conservation Service State office in New Mexico is one of a few State offices well along in converting from manually prepared drawings to computer-aided design and drafting (CADD) drawings.

After 2 years of using CADD equipment, training, and practice, SCS technicians now prepare all construction drawings with CADD. A major benefit of CADD is the short time it takes to revise original drawings.

J. Gordon Odell, SCS State conservation engineer, said, "Our accomplishments include CADD drawings for the Floodwater Diversion Landscaping project, the $4 million Eagle Tumbleweed, Channel 200 project, and the $12 million Eagle Tumbleweed, Site 2B Dam."

Technician capabilities have increased and are aligned with equipment and software capabilities. Joe Hernandez and Tom Clark, State office civil engineering technicians, completed their first set of CADD construction drawings after only 6 months of on-the-job training. They've since had advanced training and now provide CADD training to other SCS technicians in the State.

It was technicians such as these who saw a need to use a 20-inch monitor and a 14-inch monitor simultaneously. The 20-inch color monitor displays the drawing while the 14-inch monitor separately displays the menu.

Other CADD equipment includes a full-sized, 400-dot-per-inch scanner to scan existing drawings into the CADD system, and an electrostatic plotter that rapidly plots drawings.

To learn more about CADD in New Mexico, contact Greg Cunningham, USDA-SCS, State design engineer, 517 Gold Avenue, SW., Room 3301, Albuquerque, NM 87102.

Summertime Workshops Study Environment

Near beautiful Alpine, Wyo., more than 75 natural resource enthusiasts gathered in July 1991 for a 2-day workshop called Wyoming Natural Resource Days.

Jim Schwartz, range conservationist for the Soil Conservation Service in Cheyenne, Wyo., has coordinated two of the workshops in the past 3 years. Schwartz feels the diversity of natural resources and environmental interests in Wyoming is immense.

The people who attend the workshops have various interests, including agriculture, recreation, mining, tourism, education, animal rights, and industry. The numerous field trips and classroom activities keep everyone informed.

Agenda items for the workshops are as diverse as the participants and their interests. Field trips include first-hand examples of wildlife habitat management, fire ecology, wetlands/riparian management, and tree planting. Classroom workshops are offered in multiple-use or holistic resource management, rural development, animal rights, recycling, recreational-use management, communications, and environmentally accountable mining.

Participants carried away the philosophy of the Crow Indians, as presented to them by a speaker: the Crow treat the land as if they were walking on the faces of the seventh generation into the future.

Gary Dean, fisheries biologist with the Forest Service, explains riparian improvement techniques at the Wyoming Natural Resource Days workshop coordinated by the Soil Conservation Service. (Nancy Atkinson photo; 0792-19)

New Kit Available on Crop Residue

The National Association of Conservation Districts (NACD), the Conservation Technology Information Center, and the Soil Conservation Service have produced a crop-residue management kit for corn and soybeans.

The inexpensive kit can help farmers interested in leaving an adequate amount of crop residue in their fields.

The kit contains a:

- 50-foot measuring tool to measure crop-residue cover and to estimate plant populations;
- 5-minute videotape that explains how to measure and manage crop residue;
- Pocket-sized field record book for recording information such as field operations, residue amounts, and fertilizer, herbicide, and insecticide use; and a
- Crop-residue management guide presented in a 20-page color brochure. The guide has ten 5- by 7-inch color photographs showing various percentages of ground cover; it has tips on how to leave more residue; and it shows and explains five different tillage implement points.

This crop-residue management kit for corn and soybeans has valuable information for those farmers interested in leaving crop residue on the fields. (Lynn Betts photo; 0792-20)

For more information, telephone NACD at 1-800/825-5547; mention the kit's name and its product number, 117. The cost is $10, plus shipping and handling.

A similar crop-residue management kit for small-grain crops is planned for release this summer.

USDA and AID Form RSSA

The Soil Conservation Service is one of five U.S. Department of Agriculture (USDA) agencies cooperating with the Agency for International Development (AID) in the international applications of energy, environment, and natural resource issues. USDA, through its Office of International Cooperation and Development (OICD), and AID have signed a Resources Support Service Agreement (RSSA).

The agreement is noteworthy for its departure from the operating methods included in previous agreements. Agency autonomy will be maintained, and USDA staff will carry on an active involvement in domestic programs while assigned to the project.

The five USDA agencies are the Economic Research Service, Extension Service, Forest Service, OICD, and SCS.

The agreement ensures that USDA will have technical and policy input to activities under the RSSA. A staff of 27 will plan and implement these projects.

"This will provide the agency with an opportunity to make a positive contribution to U.S. government policy on natural resources around the world," said Cliff Doke, assistant director, International Conservation Division, SCS.

Gulfwatch Newsletter Is Available

The National Association of Conservation Districts (NACD) received a grant from the Environmental Protection Agency to produce the Gulf of Mexico Program's bimonthly newsletter "Gulfwatch."

The newsletter will contain stories about:

- Legislative issues pertinent to the Gulf;
- Articles about participating agencies and their activities in the program;
- Success stories from the Gulf region; and
- Articles about children's efforts in the environment.

"Gulfwatch" informs interested agencies and individuals of current activities and findings from the Gulf of Mexico Program. The first issue was released in January 1992.

Laurie Adcox, editorial specialist, and Ron Francis, director of association services, are working on the project at NACD's Service Center in League City, Tex.

Stories, photos, cartoons, other illustrations, or ideas for coverage should be forwarded to Laurie Adcox, NACD, P.O. Box 855, League City, TX 77574-0855 or by telephoning 713/332-3402. Subscriptions are free upon request by writing to the address above.

News Briefs is compiled and edited by **Kim Berry-Brown,** contributing editor, *Soil & Water Conservation News.*

NEW in Print

Wildlife and Habitats in Managed Landscapes

Edited by Jon Rodiek

Increasingly, Americans are having a significant effect on the rural landscape as development begins to encroach on former wilderness areas. This disruption of land use is leading to a continuous decline in wildlife and wildlife habitats which cannot survive the changes.

This book presents a new strategy by redefining habitats to include the concept of landscape. Natural resource managers can now apply the tools of planning, management, and design to entire landscapes.

Contents include:

- Powerline corridors, edge effects, and wildlife in forested landscapes;
- Windbreaks, wildlife, and hunters;
- Managed habitats for deer;
- Browse diversity and physiological status;
- Conservation of rain forests;
- Breeding-bird assemblages in managed northern hardwood forests; and
- Wildlife communities of southwestern riparian growth.

This 250-page, illustrated 1990 book is available for $45 (cloth) or $24.95 (paper) from Island Press, Box 7, Covelo, CA 95428; 1-800/828-1302.

Forests and Forestry In China

By S. D. Richardson

China's forest regions are vast and diverse—including the northern coniferous forests, the eastern tropical rain forests, the northern steppe and desert forests, and the western and southwestern mountain and plateau forests.

This land of 9.6 million square kilometers contains 30,000 species, including 2,800 tree species and 2,700 genera of seed plants, making China's flora among the richest in the world.

The author followed up a 1966 publication with a recent visit to China for an indepth look at current forest practices. In this comprehensive book, he details how forest resources are managed. He adds lessons learned by the Chinese that can be applied to many other developing countries.

This 352-page, illustrated 1990 publication is available for $45 (cloth) and $26.95 (paperback) from Island Press, Box 7, Covelo, CA 95428; telephone 1-800/828-1302.

New in Print is prepared by **Paul G. DuMont**, associate editor, *Soil & Water Conservation News*.

Conservation Calendar

July

3-8	National Education Association Conference, Washington, D.C.; Contact: 202/822-7750
6-9	Sixth International Conference of the International Institute of Fisheries, Economics, and Trade, Paris, France; Contact: Ann Shriver 503/737-6428
12-14	Southeastern National Association of Conservation Districts Regional Meeting, Mobile, Ala.; Contact: NACD 202/547-6223
10-24	8th International Soil Management Workshop, Oreg., Calif., and Nev.; Contact: Lisa Hokholt 916/527-2667
12-15	North Central National Association of Conservation Districts Regional Meeting, Lansing, Mich.; Contact: NACD 202/547-6223
14-22	First International Crop Science Congress, Ames, Iowa.; Contact: Kenneth Frey, Agronomy Department, Iowa State University, Ames, IA 50011;
22-24	Izaak Walton League of America National Convention, Ft. Mitchell, Ky.; Contact: Jack Lorenz 703/528-1818
26-28	South Central National Association of Conservation Districts Regional Meeting, Lafayette, La.; Contact: NACD 202/547-6223
28-30	National Livestock, Poultry, Aquaculture Residuals Management Priorities Workshop, Kansas City, Mo.; Contact: Richard Reynnells 202/720-4087

August

2-5	Northeastern National Association of Conservation Districts Regional Meeting, Wheeling, W. Va.; Contact: NACD 202/547-6223
3-7	American Society for Photogrammetry and Remote Sensing/American Congress on Surveying and Mapping and Resource Technology Convention, Washington, D.C.; Contact: Alan Voss 615/751-5425
9-12	47th Soil and Water Conservation Society Annual Meeting, Baltimore, Md.; Contact: Larry D. Davis 515/289-2331
16-21	9th International Biotechnology Congress, Arlington, Va.; Contact: American Chemical Society 202/872-4600

September

9-11	Southwestern National Association of Conservation Districts Regional Meeting, Albuquerque, N. Mex.; Contact: NACD 202/547-6223
13-16	Pacific National Association of Conservation Districts Regional Meeting, Bellevue, Wash.; Contact: NACD 202/547-6223
13-16	Association of State Dam Safety Officials Annual Meeting, Baltimore, Md.; Contact: ASDSO 606/429-0300
14-17	American Fisheries Society Meeting, Rapid City, S. Dak.; Contact: AFS 301/895-8616
26-30	Nat'l Association of State Departments of Agriculture Annual Meeting, Indianapolis, Ind.; Contact: NASDA 202/628-1566

October

19	International Symposium on Soil and Water Conservation, Honolulu, Hawaii; Contact 202/720-5063

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